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COLD-RESISTANCE ENHANCING AGENT FOR PLANTS

CLAIM(S)

A cold-resistance enhancing agent for perennials that is composed of aqueous condensation phosphate solution and can be sprayed on leaves.

DETAILED DESCRIPTION OF THE INVENTION

The present invention pertains to a cold-resistance enhancing agent for plants. More specifically, the present invention pertains to a cold-resistance enhancing agent for perennials that can be sprayed on leaves and is made of aqueous condensation phosphate solution.

Cold weather causes damages to plants. For example, grapes stop sprouting (sleeping disease), and the harvest of grapes is reduced. Tea trees and mulberry trees suffer from blight due to frost, causing enormous damages to farmers. To prevent plants from being exposed to cold weather, the following methods have been conventionally put to practice: a method to install a wind barrier around a farming site; a method to wrap a straw sheet

around every tree trunk; a method to generate smoke to stop frost. These methods, however, require high cost and much man power, which is not desirable for farmers.

The inventors of the present invention, found that spraying an aqueous condensation phosphate solution on leaves significantly improves the cold-resistance of perennials, and thereby produced the present invention.

The cold-resistance enhancing agent for perennials of the present invention is a solution containing an aqueous condensation phosphate as an effective component. The cationic portion of the condensation phosphate functions to neutralize acidity of condensation phosphate. Any desired inorganic metal cation can be used, but potassium is preferred in terms of farming. The concentration of the condensation phosphate in the cold-resistance enhancing agent needs not be specified, but the concentration of the condensation phosphate is generally adjusted to nearly 0.05%-1% of P_2O_3.

Plants to which the cold-resistance enhancing agent is to be applied are perennials that live through cold weather, for example, apple trees, pear trees, grape trees, mulberry trees, tea trees, and trees producing flowers. Spraying the cold-resistance enhancing agent of the present invention on the leaves significantly improves their resistance against cold weather, e.g., hindrance to

sprouting (sleeping disease and blight) due to cold weather is prevented, and further said agent has a secondary effect of increasing the resistance of perennials against moisture damage and bacterial disease. The embodiment examples are explained below.

(Embodiment)

Orthophosphoric acid (H_3PO_4) and anhydride (P_2O_3) are mixed, and heated for condensation. Then, the condensation phosphate with a phosphorus content 83% (P2O3) and with the following components was produced.

Orthophosphate:	6%
Pyrophosphoric acid:	19%
Tripolyphosphoric acid:	18%
Tetrapolyphosphoric acid:	15%
Penta- or higher polyphosporic acid:	42%

Nearly 85% of the entire dissociated hydroxyl group in this condensation phosphoric acid was neutralized with a potassium hydroxide (KOH) solution, and the cold-resistance enhancing agent having the following components was produced.

P_2O_3 content:	15 weight %

K_2O content: 14 weight %

H_2O content: 71 weight%

When this cold-resistance enhancing agent is sprayed on the leaves, it was diluted with water until the P_2O_5 content reached 0.05 – 1%.

To show the effect of the cold-resistance of the agent of the present invention, the testing examples are introduced below.

Test 1

Effect on mulberries

Storing nutrients in mulberries in late fall has a great impact on cold-resistance and disease-resistance in winter and on sprouting and leaf quality in the following spring. To test the effect of spraying the condensation phosphate, the following test was conducted.

(Spraying method)

A potassium orthophosphate solution (0.75% of P_2O_5, 0.7% of K_2O) for A group (reference group) and a condensation potassium phosphate solution (0.75% of P_2O_5, 0.7% of K_2O) for B group were sprayed on the leaves of 1 – 1.5 m high young shrubs until the leaves were sufficiently wet. The spraying was repeated twice, on August 20, 1970 and on September 18 of the same year.

(Examining the mulberry leaves)

The first frost came on October 31, the condition of the leaves was checked the next day. Most of the A group had blight disease and turned black, but the B group remained healthy without being damaged by frost. (Examining mulberry branches)

After both groups lost their leaves in the end of November, their 10 cm end portions were cut out of 20 branches, and growth and components were examined. This portion of the branch is a newly grown portion after the agent was sprayed, to which the phosphoric acid is not attached.

Growth and components in the 10 cm branch end portions (average of 20 branches)

	Branch stem (ratio)	Raw weight (ratio)	Weight after dried (ratio)	Phosphoric acid content	Reduced sugar	Non-reduced sugar
A group	2.94 mm (100)	19.2 g (100)	71.5 g (100)	42 mg (100)	84 mg (100)	405 mg (100)
B group	4.11 mm (140)	22.9 g (119)	11.05 g (155)	74 mg (176)	115 mg (137)	621 mg (153)

In the B group, growth of branches was excellent, and the nutrient storing level was significantly better than the A group.

(Examination of sprout blight)

Generation of blight disease was examined in April, 1971. Those that had a 30 cm (nearly 60% of total length) of afflicted portion reached 39.5% in

the A group, and 8, 8% in the B group. The condensation phosphoric acid demonstrated a great effect for blight disease.

The phosphoric acid content soluble in a 80% alcohol was 0.006% for A group and 0.01% for B group.

Sleeping disease prevention test for grapes

A potassium condensation phosphate solution (0.15% of P_2O_5 and 0.14% of K_2O) (for reference group) and a potassium orthophosphate solution (0.15% of P_2O_5 and 0.14% of K_2O) (test group) were sprayed over the leaves of 10 year old grapes (delaware) on every 15^{th} day 5 times in total since August 15, 1971. It was sprayed to 10 trees of each group, and 10 branches were selected out of each tree. The condition of sprouting was checked on April 30, 1972.

As for the fertilizer, 15 kg of N, 15 kg of P_2O_5, and 15 kg of K_2O were supplied to the soil of 10 acr in early December.

	Blighted sprout	No sprouting	Sprouting
Reference group	38.4%	9.6%	52.0%
Tested group	15.2%	3.5%	81.3%

The tested group had a lower rate of blight relative to the reference group, and the rate of sprouting was significantly high. The tested group also demonstrated powerful growth of young shoot and trees.

Translations
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